1. TAN A – Determination of magnetic moment of the bar magnet

AIM: To compare the Magnetic Moment of the given two bar magnets using a deflection Magnetometer.

APPARATUS: Deflection magnetometer, two bar magnets and meter scale.

FORMULA:

Equal distance method $$\frac{M_1}{M_2} = \frac{\tan\theta_1}{\tan\theta_2}$$

Where,

$M_1 \rightarrow$ Magnetic moment for first magnet.

$M_2 \rightarrow$ Magnetic moment for second magnet.

$\theta_1 \rightarrow$ Mean deflection for first magnet.

$\theta_2 \rightarrow$ Mean deflection for second magnet.

$d_1 \rightarrow$ Distance of the first magnet.

$d_2 \rightarrow$ Distance of the second magnet.

$L_1 \rightarrow$ is the half length of the first magnet.

$L_2 \rightarrow$ is the half length of second magnet.

PROCEDURE:

[1] Initial adjustment (Tan A Position)

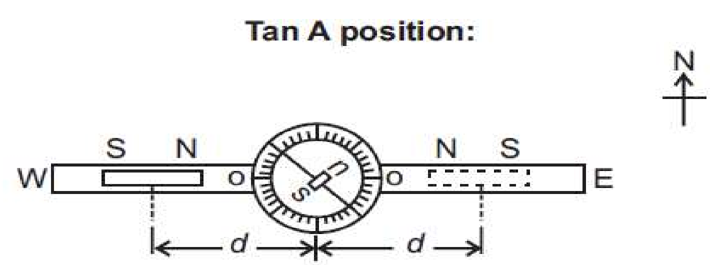
The deflection magnetometer is arranged for Tan- A- position. That mean the wooden arm is kept alone the east – west direction. So that it is parallel to the aluminum pointer. Then the magnetometer is alone rotated till the end of the pointer read zero – zero.

[2] Equal distance method:-

After making the Tan – A- Position the first bar magnet of magnetic moment M_1 is placed at a distance d on the western side of the compass box. The axis of the magnet must be perpendicular to the magnetic meridian. That is the axis must pass through the centre of the compass box. Now the magnetic needle is deflected and the readings (1, 2) at the ends of the pointer are noted. The magnet is reversed end to end at the same distance and the deflections of the pointer (3,4) are noted in the table. The magnet is placed at the same distance of the eastern side of the compass box. Now the readings (5, 6) of the pointer are noted in the table. The magnet is then reversed end to end at the same distance and the deflections of the pointer (7,8) are noted in the table. The mean of 8 readings is found as θ_1. The same above procedure is repeated again with the second magnet M_2 for the same distance. The mean of 8 readings is found as θ_2 .

DIAGRAM:

Equal distance method:



OBSERVATION:

1] Equal distance method:

S.No	Distance x 10^{-2} m	Deflection of First magnet									
		1	2	3	4	5	6	7	8	Mean θ_1	Tan θ_1
1.											
2,											

Mean Tan θ_1 = ---------

S.No	Distance x 10^{-2} m	Deflection of Second magnet									
		1	2	3	4	5	6	7	8	Mean θ_2	Tan θ_2
1.											
2,											

CALCULATION:

The ratio of the magnetic moment of the magnets:

(1) By equal distance method $\frac{M_1}{M_2} = \frac{\tan\theta_1}{\tan\theta_2}$

RESULT:

The ratio of the magnetic moment of the magnets.

(1) By equal distance method $\frac{M_1}{M_2} =$

METER BRIDGE

AIM: To determine the low resistance of the given wire.

APPARATUS: .Meter Bridge, 2.Lechlanche cell 3. Key 4.Sensitive galvanometer 5.High resistance 6. Resistance box 7. Unknown resistance and Battery.

FORMULA:

$$\text{The resistance of the wire } (X) = \frac{X1 + X2}{2}$$

Here

X = the resistance of the wire

I = the length of the wire

r = the radius of the wire

Procedure

The unknown resistance X is connected in the gap G1 and a resistance box R is connected in the gap G2. A leclanche cell and a key K are connected between the points A and C. A high resistance galvanometer and the jockey are connected as shown in fig. A suitable resistance is included in the resistance box R. The jockey is pressed at different points on the wire and the balancing point J is found. The balancing length Aj is measured as l1 and the remaining length JC is measured as l2. The experiment is repeated by changing the value of R. The readings are tabulated. The resistance of the wire is calculated using the formula given below.

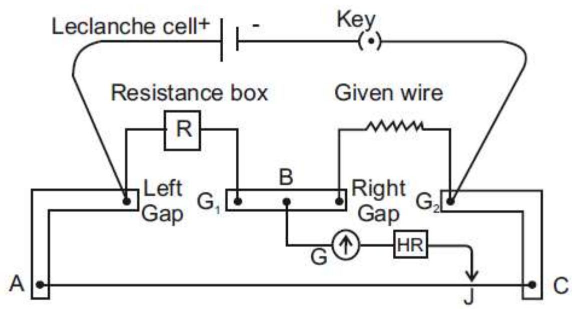
$$\text{Resistance of the wire } (X1) = R\,\frac{l1}{l2}$$

The experiment is also repeated by interchanging X and R. Measure AJ = l3 and JB = l4

$$\text{Resistance of the wire } (X1) = R\,\frac{l4}{}$$

L3

DIAGRAM



Tabular column I:

Sl. No.	Known Resistance R	Balancing lengths				$X_1 = R\frac{l_1}{l_2}$
		l_1		$l_2=100-l_1$	$l_2=1.0-l_1$	
Unit	ohm	cm	m	cm	m	ohm
1.						
2.						
3.						
4.						
5.						

To find the unknown value of resistance X_1 when R is in the gap G_2

The average value of X_1 = ohm

Tabular column I:

Sl. No.	Known Resistance R	Balancing lengths				$x_2 = R\frac{l_4}{l_3}$
		l_3		l_4=100-l_3	l_4=1.0-l_3	
Unit	ohm	cm	m	cm	m	ohm
1.						
2.						
3.						
4.						
5.						

To find the unknown value of resistance X_1 when R is in the gap G_2

The average value of X_2 = ohm

Calculation:

Average resistance of the wire $x = \frac{x_1+x_2}{2}$

Result

Resistance of the given coil of wire (X) = -------------ohm.

TAN B – Determination of magnetic moment of the bar magnet

AIM: To compare the Magnetic Moment of the given two bar magnets using a deflection Magnetometer.

APPARATUS: Deflection magnetometer, two bar magnets and meter scale.

FORMULA:

Equal distance method $$\frac{M_1}{M_2} = \frac{\tan\theta_1}{\tan\theta_2}$$

Where,

$M_1 \rightarrow$ Magnetic moment for first magnet.

$M_2 \rightarrow$ Magnetic moment for second magnet.

$\theta_1 \rightarrow$ Mean deflection for first magnet.

$\theta_2 \rightarrow$ Mean deflection for second magnet.

$d_1 \rightarrow$ Distance of the first magnet.

$d_2 \rightarrow$ Distance of the second magnet.

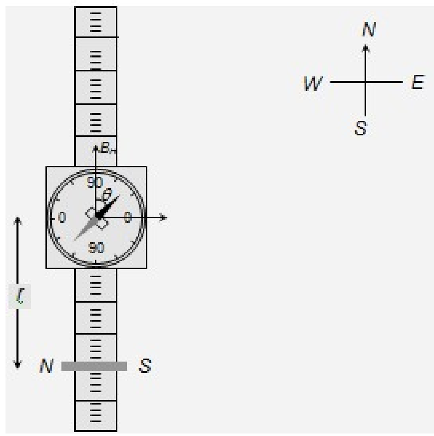
$L_1 \rightarrow$ is the half length of the first magnet.

$L_2 \rightarrow$ is the half length of second magnet.

Tan B position. The compass box alone is rotated so that the (90-90) line is parallel to the arm of the magnetometer. Then the magnetometer as a whole is rotated so that the pointer reads (0-0). The magnet is placed horizontally, but perpendicular to the arm of magnetometer.

2] Equal distance method :-

After making the Tan – B- Position the first bar magnet of magnetic moment M_1 is placed at a distance d on the north side of the compass box. The axis of the magnet must be parallel to the magnetic meridian. That is the axis must pass through the centre of the compass box. Now the magnetic needle is deflected and the readings (1, 2) at the ends of the pointer are noted. The magnet is reversed end to end at the same distance and the deflections of the pointer (3,4) are noted in the table. The magnet is placed at the same distance of the south side of the compass box. Now the readings (5, 6) of the pointer are noted in the table. The magnet is then reversed end to end at the same distance and the deflections of the pointer (7,8) are noted in the table. The mean of 8 readings is found as θ_1. The same above procedure is repeated again with the second magnet M_2 for the same distance. The mean of 8 readings is found as θ_2 .



S.No	Distance x 10^{-2} m	Deflection of First magnet									
		1	2	3	4	5	6	7	8	Mean θ_1	Tan θ_1
1.											
2,											

S.No	Distance x 10^{-2} m	Deflection of Second magnet									
		1	2	3	4	5	6	7	8	Mean θ_2	Tan θ_2

1.											
2,											

CALCULATION:

The ratio of the magnetic moment of the magnets:

(1) By equal distance method $\frac{M_1}{M_2} = \frac{\tan\theta_1}{\tan\theta_2}$

RESULT:

The ratio of the magnetic moment of the magnets.

(1) By equal distance method $\frac{M_1}{M_2} =$

De Sauty’s bridge

Aim :- To compare the capacities of two condensers (or) to find the capacitance of the given condenser, by using De Sauty’s bridge.

Apparatus :- Two condensers, two resistance boxes or two resistance pots of 10 KHz , Signal generator, head phone and well insulated connecting wires.

Formula :- Capacity of a unknown capacitor $C_2 = \frac{R_1}{R_2} x C_1$ μF

Where C_1 is the capacity of the known capacitor.

R_1 and R_2 are the variable non- inductive resistors.

Description :- The De Sauty’s bridge is an A.C Bridge works on the principle of Wheat stone’s bridge . This bridge is used to determine the capacity of an unknown capacitor C_2 in terms of the capacity of a standard known capacitor C_1. Here R_1 and R_2 are non - inductive resistors . R_1, R_2 ,C_1 and C_2 are connected in a Wheat stone’s bridge as shown in the figure-1. When the bridge is balanced, the ratios of impedances are equal as given below.

$$\frac{Z_1}{Z_2} \quad \frac{Z_3}{Z_4}$$

$$\frac{\frac{1}{j\ C_1}}{R_1} \quad \frac{\frac{1}{j\ C_2}}{R_2}$$

$$\frac{C_2}{C_1} \quad \frac{R_1}{R_2}$$

Procedure :- The connections are made as shown in the figure. The resistance R_1 and a condenser C_1 are in series in one branch of the bridge and a resistance R_2 and another capacitor C_2 are in series in another branch. The A.C signal generator frequency is adjusted to a fixed value of 1 KHz or below, which is convenient to our ear.

A resistance is unplugged in R_1 and the resistance R_2 is adjusted till the sound in the head - phone is reduced to zero level . The value of R_2 is measured with a multi-meter and noted. <u>While measuring the resistances, they should be in open circuit</u>. The above process is repeated for different values of R_1 and the values are noted in the table .

When the hum in the head – phone is at zero level , then the time constants of the upper and the lower braches of Wheat stone's bridge equal i.e. $C_1R_1 = C_2R_2$.

$$C_2 = \frac{R_1}{R_2} x C_1 \quad \mu F$$

Precautions :- 1) The connecting wires should not be in contact with the experiment table.

2) The wires are checked up for

continuity. Result :-

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Table

S.No.	Capacity of known condenser C_1 μ F	Resistance R_1 Ω	Resistance R_2 Ω	Capacity of unknown condenser $C_2 = \frac{R_1}{R_2} X C_1$ μF	Standard Value of C_2 μF
1.					
2.					
3.					
4.					
5.					
6.